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Original Research

Investigation of the Distribution of Orthodontic Anomalies Among Patients in the Eastern Anatolia Region

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ABSTRACT

Objective: This study aimed to identify dental anomalies according to Angle's classification, skeletal anomalies according to Steiner's classification, and crowding regions in 2145 patients who presented for consultation at the Department of Orthodontics in the Faculty of Dentistry at Fırat University and to determine the distribution of orthodontic anomalies in the Eastern Anatolia Region.

Methods: In this study, anamnesis forms based on the radiographic and clinical examinations of 2145 patients with ages ranging from 6 to 29 years and who applied at the University were were evaluated their skeletal anomalies were classified according to Steiner's classification and dental anomalies were classified according to Angle's classification.

Results: Of the 2145 patients, 373 (64%) were women and 772 (36%) were men. For skeletal anomaly classification, anomalies in 1377 (64.2%) patients were classified as Class I, 569 (26.5%) as Class II, and 199 (9.3%) as Class III. For dental anomaly classification, anomalies in 957 (44.6%) patients were classified as Class I, 962 (44.8%) as Class II, and 226 (10.5%) as Class III. The distributions of these anomalies were also investigated in terms of age, sex, and crowding region.

Conclusion: In this sample of the Turkish population consisting of orthodontics patients in the Eastern Anatolia Region, statistically significant differences were observed in terms of age–skeletal and age–dental anomalies.

Keywords: Orthodontic anomaly, Angle's classification, crowding, prevalence, Turkish population

INTRODUCTION

Orthodontics is a field specialization in dentistry, which studies the relationship of teeth, tooth cavities, jaw and facial complexes with each other and soft tissues, and it attempts to correct abnormal ones by determining the ideal relationships between these or to prevent anomalies even before they are formed. Skeletal elements of the human face consist of numerous pieces and disproportions between these pieces result in orthodontic anomalies (1). Although many methods have been used in the classification of orthodontic anomalies to date, the most commonly used classification is Angle's classification (2). Edward H. Angle, the father of modern orthodontics, is recognized as the first person who limited his studies to orthodontics and the first orthodontics specialist in the world (3).

Several studies have been conducted on the distribution of orthodontic anomalies in different populations (4-19). Although the studies in the literature reported the frequencies of anomalies in different groups, few studies have been conducted within a certain population (20, 21). Therefore, this study aimed to identify orthodontic anomalies in patients who presented for consultation at the Department of Orthodontics in the Faculty of Dentistry at Fırat University, which serves a large area since the opening of the clinic, while investigating the frequencies of these anomalies in the Turkish population in the Eastern Anatolia Region, and their distribution in terms of age, sex, and crowding regions.

METHODS

Ethics Statement

This study was conducted in accordance to the ethical principles of medical research on human volunteers specified in the World Medical Association Declaration of Helsinki. Ethics Committee approval dated 17/10/2019 with meeting no. 15 and decree no. 07 was obtained from Fırat University for the research.

A total of 2145 patients from the ages of 6 to 29 years old, including 1373 females and 772 males, who presented for consultation at the Department of Orthodontics in the Faculty of Dentistry at Fırat University between 01/01/2016 and 31/08/2019 with orthodontic anomalies were evaluated in this study.

By investigating the anamnesis forms based on the radiographic and clinical examinations of the patients, the anomalies of patients were classified as Class I, Class II, and Class II for skele-

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Table 1. Distribution of Skeletal Anomalies According to Sex

	Female		Male		Total		
Skeletal Anomaly	**n**	**%**	**n**	**%**	**n**	**%**	**p***
Class I	901	65.6	476	61.7	1377	64.2	0.177
Class II	348	25.3	221	28.6	569	26.5	
Class III	124	9.0	75	9.7	199	9.3	
Total	1373	100.0	772	100.0	2145	100.0	

*p: Pearson Chi–Square

Table 2. Distribution of Dental Anomalies According to Sex

	Female		Male		Total		
Dental Anomaly	**n**	**%**	**n**	**%**	**n**	**%**	**p***
Class I	608	44.3	349	45.2	957	44.6	0.143
Class II Division 1	528	38.5	264	34.2	792	36.9	
Class II Division 2	56	4.1	34	4.4	90	4.2	
Class II Subdivision	48	3.5	32	4.1	80	3.7	
Total Class II	632	46.0	330	42.8	962	44.8	
Class III	133	9.7	93	12.0	226	10.6	
Total	1373	100.0	772	100.0	2145	100.0	

*p: Pearson Chi–Square

tal anomalies and as Class I, Class II Division 1, Class II Division 2, Class II Subdivision, and Class III for dental anomalies. Considering the fact that studies in the literature did not conduct dental classification in such detail, Class II Division 1, Class II Division 2, and Class II Subdivision anomalies were collected under a single Class II classification and examined once more to compare these findings with the findings of other studies. Additionally, classifications of the present crowding in all the patients were conducted according to their locations as incisor, premolar, and molar regions. The patients who previously went through treatment, who had insufficient material, and whose accuracies were doubted or hesitated about were excluded from the study.

Statistical Analysis

In the statistical analysis of the resulting data, IBM SPSS package software version: 24.0, (IBM SPSS Corp.; Armonk, NY, USA) was used to conduct the relevant analyses. The normality of the distribution of continuous variables was tested using the Shapiro Wilk test. In the descriptive analyses, categorical variables were presented as frequency and percentage [n (%)], and analyzed using Pearson's Chi-squared test. The results were interpreted at a 95% confidence interval while a p-value <0.05 was accepted as the statistical significance level.

Main Points:

- This study researched to identify orthodontic anomalies in patients who presented for consultation at the Department of Orthodontics in the Faculty of Dentistry at Fırat University.
- The aimed investigating the frequencies of orthodontic anomalies in the Turkish population in the Eastern Anatolia Region.

RESULTS

A total of 2145 patients were included in this study, including 1373 (64%) females and 772 (36%) males. The distributions of the skeletal anomalies, dental anomalies, and crowding in these patients according to sex are presented in tables 1, 2, 3, and 4. No statistically significant differences were found between sex and skeletal anomaly (p=0.177), dental anomaly (p=0.143), and crowding (p=0.915).

In the distribution of skeletal anomalies among the patients included in the study, it was observed that the Class I relationship was the most common in the 22–25 years group, Class II relationship was the most common in the 6–12 years group, and the Class III relationship was the most common in the 26–29 years old group (Table 5). Statistically significant differences were observed between age and skeletal anomaly (p<0.001).

In the distribution of the dental anomalies, it was observed that the Class I relationship was the most common in the 22–25 years

Table 3. Distribution of Dental Class II Anomalies According to Sex

	Female		Male		Total		
Class II Anomaly	**n**	**%**	**n**	**%**	**n**	**%**	**p***
Division 1	528	83.5	264	80.0	792	82.3	0.213
Division 2	56	8.9	34	10.3	90	9.4	
Subdivision	48	7.6	32	9.7	80	8.3	
Total	632	100.0	330	100.0	962	100.0	

*p: Pearson Chi–Square

Table 4. Distribution of Crowding Regions According to Sex

	Female		Male		Total		
Crowding	**n**	**%**	**n**	**%**	**n**	**%**	**p***
Incisors	1355	98.7	763	98.8	2118	98.7	0.915
Premolars	13	0.9	7	0.9	20	0.9	
Molars	5	0.4	2	0.3	7	0.3	
Total	1373	100.0	772	100.0	2145	100.0	

*p: Pearson Chi–Square

Table 5. Distribution of Skeletal Anomalies According to Age

	Class I		Class II		Class III		Total		
Age	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**p***
6–12	176	54.0	115	35.3	35	10.7	326	100.0	0.001
13–15	421	63.0	192	28.7	55	8.2	668	100.0	
16–18	501	67.5	187	25.2	54	7.3	742	100.0	
19–21	169	65.8	53	20.6	35	13.6	257	100.0	
22–25	71	77.2	12	13.0	9	9.8	92	100.0	
26–29	39	65.0	10	16.7	11	18.3	60	100.0	
Total	1377	64.2	569	26.5	199	9.3	2145	100.0	

*p: Pearson Chi–Square

group, Class II relationship was the most common in the 13–15 years group, and Class III relationship was the most common in the 26–29 years group (Table 6). Statistically significant differences were observed between age and dental anomaly ($p<0.005$).

In the patients included in this study, no statistically significant differences were observed between crowding region and age ($p=0.344$), sex ($p=0.915$), skeletal anomaly ($p=0.770$), and dental anomaly ($p=0.791$).

DISCUSSION

Due to the availability of various methods for the classification of orthodontic anomalies, it is challenging to establish a universal classification (6, 21, 22). Tang et al. (22) stated that Angle's classification neglects the ratio between the teeth and face, while Gravely and Johnson (23) stated that different people conducted different measurements in Angle's classification, which led to errors in the classification. Furthermore, Ackerman and Proffit (8) criticized certain aspects of Angle's classification of being weak. Despite all of these criticisms, Angle's classification remains the most commonly adopted and accepted classification to date, due to its reliability, simplicity, and practicality in clinical applications (2).

The anomalies of patients included in the study were classified into Class I, Class II, and Class III according to their skeletal anom-

Table 6. The Relationship between Dental Classification and Age Distribution

	Class I		Class II		Class III		Total		
Age Interval	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**p***
6–12	145	44.5	150	46.0	31	9.5	326	100.0	
13–15	279	41.8	325	48.7	64	9.6	668	100.0	
16–18	340	45.8	332	44.7	70	9.4	742	100.0	
19–21	119	46.3	104	40.5	34	13.2	257	100.0	0.005
22–25	49	53.3	30	32.6	13	14.1	92	100.0	
26–29	25	41.7	21	35.0	14	23.3	60	100.0	
Total	957	44.6	962	44.8	226	10.5	2145	100.0	

*p: Pearson Chi–Square

alies and into Class I, Class II Division 1, Class II Division 2, Class II Subdivision, and Class III according to their dental anomalies using Angle's classification. Given that previous studies in the literature did not conduct dental classification in such detail, Class II Division 1, Class II Division 2, and Class II Subdivision anomalies were regrouped under a single group, Class II, and evaluated once more. Another significant detail in the current study is that the studies in the literature conducted on the prevalence of anomalies in different populations were limited to investigating the distribution of dental anomalies. It is an authentic aspect of the current study to investigate the distribution of dental anomalies along with the distribution of skeletal anomalies. Furthermore, all the patients were classified according to the regions of crowding as incisor, premolar, and molar region, whereas crowding regions were investigated in terms of their relationship with the skeletal and dental anomalies, age, and sex.

In the classification of skeletal anomalies, it was observed that the number of Class I anomalies was higher than that of other anomalies. Of the 2145 patients investigated, 1377 (64.2%) had Class I anomalies, 596 (26.5%) had Class II anomalies, and 199 (9.3%) had Class III anomalies.

In the classification of dental anomalies, it was observed that the total number of Class II anomalies was higher than that of other anomalies. Of the 2145 patients investigated, 962 (44.8%) had Class I anomalies, 957 (44.6%) had Class II anomalies, and 226 (10.6%) had Class III anomalies. When Class II was evaluated in sections, it was determined that the 2154 patients included 957 (44.6%) patients with Class I anomalies, 792 (36.9%) patients with Class II Division 1 anomalies, 226 (10.6%) Class III anomalies, 90 (4.2%) patients with Class II Division 2, and 80 (3.7%) patients with Class II Subdivision anomalies. Compared with the findings of previous studies conducted on dental anomalies within the Turkish society, it was determined the number of dental Class II anomalies was increased (24, 25).

In this study, which investigated the Turkish population of patients in the Eastern Anatolia Region, it was observed that the number of Class I anomaly in the skeletal anomaly distribution and that of Class II anomaly in the dental anomaly were higher than the number of other anomalies. It was determined that there were statistically significant relationships between both skeletal and dental anomaly distributions and age groups.

The distribution of orthodontic anomalies in the Turkish population has not been reported in the literature in detail. In the study of Sarı et al. (24) conducted in the Turkish population, it was determined that 61.7%, 28.1%, and 10.2% of the patients were classified as Class I, Class II, and Class III, respectively. Although the rate of Class II anomalies was almost the same in this study, contrary to the current study, the rate of Class I anomalies was definitely higher in their study compared to the rate of Class II anomalies. This could be explained by the fact that this study evaluated patients who underwent treatments rather than all of the patients who consulted at their clinic. Additionally, the study conducted by Sari et al. (24) included only a dental classification and no skeletal classification.

In the study conducted by Yang (20) in Seoul, it was reported that 35.9% of the patients had Class I, 14.9% had Class II, and 49.1% had Class II anomalies. Here, it is observed that the frequency of Class III malocclusion is higher compared to those in the literature and the current study. This is believed to be due to ethnic differences.

In the current study, because only patients who wished to undergo orthodontic treatment were covered, it is not surprising to observe that the rate of Class I malocclusion is lower compared to the literature while the rates of Class II and Class III malocclusion are higher compared to the literature. This could be explained by the fact that the rate of anomalies in patients who presented to the orthodontics clinic with a desire to undergo treatment is higher compared to individuals who were investigated by prevalence studies conducted among individuals who did not have any desire to undergo treatment, such as students in schools, etc. Another reason could be the fact that the type of anomaly is a factor that directly affects patients' desire to undergo treatment. In the study conducted by Wilmont et al. (26), it was reported that the patients with severe Class II malocclusion had a greater

motivation to undergo orthodontic treatment compared to patients with Class III anomalies.

In the study conducted by Jones (19) with 132 patients in Saudi Arabia, the prevalence of orthodontic anomalies was investigated and it was reported that 53.8% of the patients had Class I anomalies, 33.3% had Class II anomalies, and 12.9% had Class III anomalies. Although the prevalence of the anomalies in this study was similar to those in the literature, it is believed that these results do not represent the prevalence of the population due to the rather small sample size. Furthermore, in this study, the prevalence of dental anomalies alone was investigated, while the prevalence of skeletal anomalies was not investigated.

CONCLUSION

When a sample of the Turkish population, which consisted of orthodontics patients in the Eastern Anatolia Region, was investigated, the following results were concluded:

1. Approximately two-thirds of the patients were females (64%). No statistically significant differences were observed in terms of sex-skeletal anomaly, sex-dental anomaly, and sex-crowding.
2. Statistically significant differences were observed between age–skeletal anomaly and age–dental anomaly.
3. It was determined that the most common skeletal anomaly was Class I anomalies while the least common anomaly was Class III anomalies.
4. It was determined that the most common dental anomaly was Class II anomalies while the least common anomaly was Class III anomalies.

Ethics Committee Approval: Ethics committee approval was received for this study from the Clinical Trials Ethics Committee of Fırat University (17.10.2019/meeting no: 15/decree no: 07).

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